Methods for Generation of a Fish Consumption Advisory

D. Jason Scholl, Ph.D.

Environmental Epidemiology

Utah Department of Health

Utah Department of Health

Desolation Canyon, Green River

Desolation Canyon

Utah Department of Health

Desolation Canyon, 2002 Results, Individual Fillets

Species	Mercury ppm	Average ppm
Channel catfish	0.307	
Channel catfish	0.128	0.225
Channel catfish	0.291	
Smallmouth bass	0.143	
Smallmouth bass	0.148	0.139
Smallmouth bass	0.127	
Common carp	0.114	
Common carp	0.111	0.111
Common carp	0.110	
Red shiner	0.092	-

Desolation Canyon, 2005 Results, Individual Fillets

	Mercury ppm
Channel Catfish	0.54
	0.38
	0.56
	0.35
	0.81
	0.28
	0.91
	0.32
	0.70
	0.24
Average =	0.51

8 of 10 catfish above screening value of 0.3 ppm

Utah Department of Health

Fish Advisory Recommendations

• Based on the mercury levels found in channel catfish from Desolation Canyon (Green River), UDOH recommends a fish consumption advisory as follows:

Adults: no more than 2 eight-oz meals/month
Children and pregnant women: no more than 1 four-oz meal/month of channel catfish from Desolation Canyon

Data Review Process

- Screening Value (SV)
  -value which warrants further investigation

- Consumption Rate calculations
  -maximum allowable fish consumption (kg/day)

- Consumption Limits
  - maximum allowable fish consumption (meals/month)

Utah Department of Health

Screening Value

SV = [(MRL)(BW)]/CR

SV = Screening Value for mercury (mg/kg or ppm)
MRL = Minimal risk level (Hg = 0.0001 mg/kg/day)
BW = Body weight (70 kg)
CR = Mean daily consumption (0.025 kg/day)

EPA standard SV for mercury is 0.3 mg/kg (ppm)

Consumption Rate

$CR_{lim} = [(MRL)(BW)]/C_m$

CR_{lim} = Maximum allowable fish consumption (kg/day)
MRL = Minimal risk level (Hg = 0.0001 mg/kg/day)
BW = Body weight (70 kg for adults, 16 kg for children)
C_m = Measured concentration of mercury in fish (mg/kg)

Based on the measured concentration and body weight, the CR_{lim} is the maximum consumption rate allowable without human health effects.

Consumption Limits

$CR_{mm} = [(CR_{lim})(T_{ap})]/MS$

CR_{mm} = Maximum allowable fish consumption (meals/month)
CR_{lim} = Calculated (kg/day)
T_{ap} = Time averaging period (30.44 days/month)
MS = Meal size (0.227 kg fish/meal for adults, 0.113 for children)

Based on the consumption rate limit and meal size, the CR_{mm} is the maximum allowable meals per month without human health effects.

Utah Department of Health

Advisory Process

- Agencies collect samples, have them analyzed for mercury
- UDOH analyzes data, generates health consultation report, generates fish consumption recommendations if necessary
- Internal review of report and analysis
- Joint press release
- UDOH produces and distributes fish advisory signs and fact sheets on mercury for species and location

Utah Department of Health

Promote Prevent Protect

Assessment of Mercury in Human Hair Study

"An Investigation of Factors Related to Levels of Mercury in Human Hair"

Environmental Quality Institute

Utah Data
All Participants

	# Participant	# above 1.0 ppm	% above 1.0 ppm	Average Hg in hair
National	**6571**	**1529**	**23%**	**-**
Utah	**139**	**21**	**15%**	**0.67 ppm**
SLC	**121**	**15**	**12%**	**0.59 ppm**

Utah Department of Health

Utah Data
Women of Childbearing Age (16-49)

	# Participant	# above 1.0 ppm	% above 1.0 ppm	Average Hg in hair
National	**2828**	**640**	**23%**	**-**
Utah	**41**	**4**	**10%**	**0.56 ppm**
SLC	**35**	**2**	**6%**	**0.39 ppm**

Utah Department of Health

Why 1.0 ppm in Hair?

- The EPA's RfD for methylmercury is 0.0001 ppm/day. The RfD is a dose within a range of exposures judged to be without known adverse effects.

- RfD is associated with a hair Hg concentration of 1.1 ppm.

- The RfD has a "safety" factor of 10X, based on a benchmark dose of 11 ppm Hg in hair.

- 11 ppm Hg in hair is equivalent to a "NOAEL" of neurodevelopmental changes.

Unknowns About Hair Mercury

- Hair mercury levels do not reveal source.
  - Local vs. Commercial fish.
  - Food vs. Occupational vs. Other environmental

- Hair mercury levels are from *past* exposure.

Fish Mercury Levels

Utah Advisories		
	Species	Hg Level
Mill Creek	Brown Trout	0.33 ppm
Gunlock	Largemouth Bass	0.47 ppm
Desolation Canyon	Channel Catfish	0.51 ppm
	FDA/EPA Advisories	
	Species	
	King Mackerel	0.73 ppm
	Shark	0.988 ppm
	Swordfish	0.976 ppm
	Tilefish	1.45 ppm

FDA/EPA Recommendations

For women and children to receive the benefits of eating fish and shellfish, they should follow these 3 recommendations:

1. Do not eat Shark, Swordfish, King Mackerel, or Tilefish.
2. Eat up to 12 oz/week of a variety of low mercury fish such as: shrimp, canned light tuna, salmon, pollock, and catfish.
3. Check local advisories for fish from local lakes, rivers and coastal areas.